

## WHAT IS CLAIMED IS:

1. An image processing apparatus for executing a smoothing process of image data, comprising:

5 extraction means for extracting a pixel of interest and surrounding pixels thereof from input image data;

first average value calculation means for calculating an average value of the pixels extracted by said extraction means;

10 separation means for separating the pixels extracted by said extraction means into two categories using the average value calculated by said first average value calculation means;

second average value calculation means for  
15 calculating average pixel values of the two categories;  
and

output means for outputting a value, which is approximate to a pixel value of the pixel of interest, of the average pixel values of the two categories  
20 calculated by said second average value calculation means.

2. An image processing apparatus for executing a smoothing process of image data, comprising:

extraction means for extracting a pixel of  
25 interest and surrounding pixels thereof from input image data;

first average value calculation means for  
calculating an average value of the pixels extracted by  
said extraction means;

separation means for separating the pixels  
5 extracted by said extraction means into two categories  
using the average value calculated by said first  
average value calculation means;

second average value calculation means for  
calculating average pixel values of the two categories;

10 determination means for determining whether or  
not the pixel of interest belongs to a flat region; and

output means for, when said determination means  
determines that the pixel of interest belongs to a flat  
region, outputting the average value calculated by said  
15 first average value calculation means as smoothed data,  
and for, when said determination means determines that  
the pixel of interest does not belong to a flat region,  
outputting a value, which is approximate to a pixel  
value of the pixel of interest, of the average pixel  
20 values of the two categories calculated by said second  
average value calculation means.

3. An image processing apparatus for executing a  
smoothing process of image data, comprising:

image reduction means for reducing an input  
25 image;

extraction means for extracting a pixel of interest and surrounding pixels thereof from the image reduced by said image reduction means;

first average value calculation means for  
5 calculating an average value of the pixels extracted by said extraction means;

separation means for separating the pixels extracted by said extraction means into two categories using the average value calculated by said first  
10 average value calculation means;

second average value calculation means for calculating average pixel values of the two categories; and

output means for outputting a value, which is  
15 approximate to a pixel value of the pixel of interest, of the average pixel values of the two categories calculated by said second average value calculation means.

4. An image processing apparatus for executing a  
20 smoothing process of image data, comprising:

image reduction means for reducing an input image;

extraction means for extracting a pixel of interest and surrounding pixels thereof from the image  
25 reduced by said image reduction means;

first average value calculation means for calculating an average value of the pixels extracted by said extraction means;

separation means for separating the pixels  
5 extracted by said extraction means into two categories using the average value calculated by said first average value calculation means;

second average value calculation means for calculating average pixel values of the two categories;

10 determination means for determining whether or not the pixel of interest belongs to a flat region; and

output means for, when said determination means determines that the pixel of interest belongs to a flat region, outputting the average value calculated by said  
15 first average value calculation means as smoothed data, and for, when said determination means determines that the pixel of interest does not belong to a flat region, outputting a value, which is approximate to a pixel value of the pixel of interest, of the average pixel  
20 values of the two categories calculated by said second average value calculation means.

5. The apparatus according to claim 1, further comprising:

selection means for selecting one of the value  
25 output by said output means and the pixel value of the pixel of interest in accordance with a difference value

between the value output by said output means and the pixel value of the pixel of interest.

6. An image processing method for executing a smoothing process of image data, comprising the steps  
5 of:

(a) extracting a pixel of interest and surrounding pixels thereof from input image data;

(b) calculating an average value of the pixels extracted in the step (a);

10 (c) separating the pixels extracted in the step (a) into two categories using the average value calculated in the step (b);

(d) calculating average pixel values of the two categories; and

15 (e) outputting a value, which is approximate to a pixel value of the pixel of interest, of the average pixel values of the two categories calculated in the step (d).

7. An image processing method for executing a  
20 smoothing process of image data, comprising the steps of:

(a) extracting a pixel of interest and surrounding pixels thereof from input image data;

(b) calculating an average value of the pixels  
25 extracted in the step (a);

(c) separating the pixels extracted in the step (a) into two categories using the average value calculated in the step (b);

(d) calculating average pixel values of the two  
5 categories;

(e) determining whether or not the pixel of interest belongs to a flat region; and

(f) outputting, when it is determined in the step (e) that the pixel of interest belongs to a flat  
10 region, the average value calculated in the step (b) as smoothed data, and outputting, when it is determined in the step (e) that the pixel of interest does not belong to a flat region, a value, which is approximate to a pixel value of the pixel of interest, of the average  
15 pixel values of the two categories calculated in the step (d).

8. An image processing method for executing a smoothing process of image data, comprising the steps of:

20 (a) reducing an input image;

(b) extracting a pixel of interest and surrounding pixels thereof from the image reduced in the step (a);

(c) calculating an average value of the pixels  
25 extracted in the step (b);

(d) separating the pixels extracted in the step (b) into two categories using the average value calculated in the step (c);

(e) calculating average pixel values of the two  
5 categories; and

(f) outputting a value, which is approximate to a pixel value of the pixel of interest, of the average pixel values of the two categories calculated in the step (e).

10 9. An image processing method for executing a smoothing process of image data, comprising:

(a) reducing an input image;

(b) extracting a pixel of interest and surrounding pixels thereof from the image reduced in  
15 the step (a);

(c) calculating an average value of the pixels extracted in the step (b);

(d) separating the pixels extracted in the step (b) into two categories using the average value  
20 calculated in the step (c);

(e) calculating average pixel values of the two categories;

(f) determining whether or not the pixel of interest belongs to a flat region; and

25 (g) outputting, when it is determined in the step (f) that the pixel of interest belongs to a flat region, the average value calculated in the step (c) as

smoothed data, and outputting, when it is determined in the step (f) that the pixel of interest does not belong to a flat region, a value, which is approximate to a pixel value of the pixel of interest, of the average  
5 pixel values of the two categories calculated in the step (e).

10. The method according to claim 6, further comprising the step of:

(f) selecting one of the value output in the  
10 step (e) and the pixel value of the pixel of interest in accordance with a difference value between the value output in the step (e) and the pixel value of the pixel of interest.

11. Computer executable program code for executing a  
15 smoothing process of image data, the code comprising:

an extraction step of extracting a pixel of interest and surrounding pixels thereof from input image data;

a first average value calculation step of  
20 calculating an average value of the pixels extracted in the extraction step;

a separation step of separating the pixels extracted in the extraction step into two categories using the average value calculated in the first average  
25 value calculation step;



a second average value calculation step of  
calculating average pixel values of the two categories;  
and

an output step of outputting a value, which is  
5 approximate to a pixel value of the pixel of interest,  
of the average pixel values of the two categories  
calculated in the second average value calculation step.

12. A computer-readable medium having  
computer-executable program code for executing a  
10 smoothing process of image data, the code comprising:

an extraction step of extracting a pixel of  
interest and surrounding pixels thereof from input  
image data;

a first average value calculation step of  
15 calculating an average value of the pixels extracted in  
the extraction step;

a separation step of separating the pixels  
extracted in the extraction step into two categories  
using the average value calculated in the first average  
20 value calculation step;

a second average value calculation step of  
calculating average pixel values of the two categories;  
and

an output step of outputting a value, which is  
25 approximate to a pixel value of the pixel of interest,  
of the average pixel values of the two categories  
calculated in the second average value calculation step.